



Iris Color and Visual Functions

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Objective: To find out which type of iris colors significantly affect the visual functions.

Method: Study was conducted on seventy five individuals having seven different iris color with 6/6 visual acuity and no associated ocular pathology. Visual functions were assessed by using structured Proforma in the month of August, September and October 2014. Visual acuity was assessed by Snellen visual acuity chart, color vision was assessed by ishihara color vision chart, contrast sensitivity was assessed by lea number contrast sensitivity chart, Glare sensitivity was assessed by shining a bright light of pen torch onto the individual's eye for 30 seconds after that visual acuity was measured within 3 to 5 second and visual field was assessed by confrontation method.

Results: Hundred percent subjects with different iris color gave 6/6 visual acuity, 100% subjects gave 12/12 color vision on ishihara color vision chart, 81% individuals with different iris color gave 1.25% contrast sensitivity on lea number contrast sensitivity chart, 99% individuals with different iris color gave glare visual acuity between 6/12-6/18 and 100% individuals with different iris color gave full to confrontation visual field. P value for all result was more than 0.05.

Conclusion: Visual functions were not affected by different iris colors. 100% subjects of different iris colors fall in normal range of visual acuity, color vision, glare sensitivity and visual field. Anyhow 81% person represented the normal contrast

Key words:

Iris color, visual acuity, contrast sensitivity, glare sensitivity, color vision, visual field



Introduction:

The color of the eye is determined by the color of iris. The color of the iris is mixture of melanin pigments in stroma. In the earlier studies the color of iris was categorized into two groups but in new classification color of iris is divided into many groups. Iris color has close relationship with many diseases such as ocular melanoma, myopia, diabetes and cataract.¹ Iris is a moveable object which is hidden in another moveable object (eye) which is almost covered by the eyelids.

There is dilation and contraction of pupil depending on the intensity of light.² Many ocular disorders can affect the color of iris. In the stroma of iris there are melanin pigments which are responsible for the color of iris.³ There are five visual functions.

1. Visual acuity is the measurement of the capability to differentiate between two stimuli separated in space at high contrast in relation to background.⁴
2. Contrast sensitivity is the capability of visual system to discriminate between the object and its low contrast background.⁵
3. Glare sensitivity is transient loss of visual function that occurs in the presence of a bright nearby source of light.⁶
4. Color vision is the capability to differentiate stimulus of light as a function of its wavelength.⁷ Color vision permits to discriminate alterations in the division of spectral energies reaching the eye.⁸
5. The visual field represents the area in which things can be visualized in the periphery while you focus your eyes on a central point to see objects in front of eye hence we can see the total environment.⁹

Visual acuity can be explained as the reciprocal of the value of gap size of the smallest predictable letter Landolt C.¹⁰ The method by which we measure the function of fovea is the measurement of visual acuity.¹¹ Myopia is very common ocular disease in world. The color of iris affects myopia by influencing the extent and the color of light which enters the eyes.¹²

Materials and Methods:

It was cross sectional study, conducted in College of Ophthalmology and Allied Vision Sciences (COAVS), from August 2014 to December 2014. Seventy five patients aged between 10 to 40 years were included in study by using non probability convenient sampling method. Dependent variables were visual acuity, color vision, Contrast sensitivity, glare sensitivity and visual field chart while independent variables were comprised as age and gender. Verbal and cooperative clients, Between 10 to 40 years of age, and having best corrected visual acuity equal to 6/6 were included in study. Patients, who were mentally retarded, uncooperative persons, and patients who had ocular diseases that affect

visual functions were excluded. Distance visual acuity was assessed by using Snellen visual acuity chart, contrast sensitivity was assessed Lea number contrast sensitivity chart, color vision was assessed by using Ishihara color vision chart, glare sensitivity was assessed by using Brightness acuity test and visual acuity test was assessed by confrontation method. Visual functions of different iris colors were assessed by filling a self-structured proforma. Data was recorded and entered in Statistical Package for Social Science (SPSS version 20.0). The results were analyzed and tabulated by using same software.

Results:

Table 1: iris colour * colour vision right eye

		colour vision right eye	Total
		12/12	
iris colour	dark brown	7	7
	light brown	16	16
	honey brown	8	8
	light green	18	18
	light grey	16	16
	light blue	3	3
	heterochromia	7	7
Total		75	75

Table 2: iris colour * colour vision left eye

		colour vision left eye	Total
		12/12	
iris colour	dark brown	7	7
	light brown	16	16
	honey brown	8	8
	light green	18	18
	light grey	16	16
	light blue	3	3
	heterochromia	7	7
Total		75	75

Table 3: iris colour * contrast sensitivity right eye

		contrast sensitivity right eye			Total
		5%	2.5%	1.25%	
iris colour	dark brown	0	1	6	7
	light brown	1	3	12	16
	honey brown	0	1	7	8
	light green	0	4	14	18
	light grey	0	2	14	16
	light blue	0	1	2	3
	heterochromia	0	1	6	7
Total		1	13	61	75


Table 4 : iris colour * contrast sensitivity left eye

		contrast sensitivity left eye			Total
		5%	2.5%	1.25%	
iris colour	dark brown	0	1	6	7
	light brown	1	3	12	16
	honey brown	0	1	7	8
	light green	0	4	14	18
	light grey	0	2	14	16
	light blue	0	1	2	3
	heterochromia	0	1	6	7
Total		1	13	61	75

Table 5: iris colour * glare sensitivity right eye

		colour vision right eye	Total
		6/12-6/18	
iris colour	dark brown	7	7
	light brown	16	16
	honey brown	8	8
	light green	18	18
	light grey	16	16
	light blue	3	3
	heterochromia	7	7
Total		75	75

Table 6 :iris colour * glare sensitivity left eye

		glare Sensitivity eye	Total
		6/12-6/18	
iris colour	dark brown	7	7
	light brown	16	16
	honey brown	8	8
	light green	18	18
	light grey	16	16
	light blue	3	3
	heterochromia	7	7
Total		75	75

Explanation:

Table 1 and table 2 are showing that color vision is normal in all iris colors which indicated that color vision is not affected by different iris colors. Table 3 and table 4 are showing that contrast sensitivity is normal in 61 people (81.33%) . Table 5 and table 6 are showing that Individuals of different iris colors exhibited normal glare sensitivity so iris color did not significantly affect the glare sensitivity.p value was more than 0.05 for all results.

Discussion:

Different studies have been conducted to show the correlation between different iris colors and the visual functions. In white population majority of individuals have light iris colors due to the less pigmentation in their skin. Due to the less concentration of melanin in their eyes and due to different environmental factors such as cold, those people suffer many problems in their daily life such as they have to face the problems of decreased contrast sensitivity and glare.

Nischler C et al conducted a study to prove that visual function (contrast sensitivity and glare sensitivity) were affected by the light iris colors. He proved that individuals of light iris colors had the poor contrast sensitivity and glare sensitivity.¹³ This study comprised of different seven colors of iris (dark brown, light brown, honey brown, light green, light blue, light blue and heterochromia). All visual functions were assessed in different iris color.

Assessment of visual acuity by using Snellen chart revealed that there was no significant relationship between different iris color and visual acuity. Lea number contrast sensitivity chart was used to check the contrast sensitivity function in all individuals of different iris color which showed no relationship between iris color and contrast sensitivity. All subjects of different iris colors gave normal color vision on Ishihara color vision chart showing no significant effect on color vision.

Glare sensitivity was assessed by shining a bright light of pen torch onto the individual's eye for 30 seconds after that visual acuity was measured within 3 to 5 second. Visual acuity falls in normal range in all subjects of different iris color, which indicated that there was no significant correlation between glare sensitivity and different iris color.

Visual field was assessed by confrontation method ant it was full to confrontation in all subjects of different iris color. Above discussion showed that all individuals of different iris colors fall in normal range of visual function. So there is no significant relationship between iris colors and visual functions.

Conclusion:

Visual functions were not affected by different iris colors. 100% subjects of different iris colors fall in normal range of visual acuity, color vision, glare sensitivity and visual field. Anyhow 81% person represented the normal contrast sensitivity. So it showed that there was no association between iris color and visual functions.

Reference:

1. Simionescu O, Grigore M, Furtunescu F, Minca D, Chitu V, Costache M. A Novel Iris Colour Classification Scale. Annual Research & Review in Biology. 2014;4(15):2525.



2. Emine Krichen MC, Sonia Garcia-Salicetti, Bernadette Dorizzi. Color-Based Iris Verification. 2007;4642.
3. Imesch PD, Wallow IH, Albert DM. The color of the human eye: a review of morphologic correlates and of some conditions that affect iridial pigmentation. *Survey of ophthalmology*. 1997;41:S117-S23.
4. Kniestedt C, Stamper RL. Visual acuity and its measurement. *Ophthalmology clinics of North America*. 2003;16(2):155-70, v.
5. Cormack FK, Tovee M, Ballard C. Contrast sensitivity and visual acuity in patients with Alzheimer's disease. *International journal of geriatric psychiatry*. 2000;15(7):614-20.
6. Barbara Neeracher M, Peter Senn, MD, Isaak Schipper. Quality of vision in refractive and cataract surgery, indirect measurers: review article. 2004;30.
7. Papaconstantinou D, Georgalas I, Kalantzis G, Karmiris E, Koutsandrea C, Diagourtas A, et al. Acquired color vision and visual field defects in patients with ocular hypertension and early glaucoma. *Clinical ophthalmology*. 2009;3:251-7.
8. Jacobs GH. Evolution of colour vision in mammals. *Philosophical transactions of the Royal Society of London Series B, Biological sciences*. 2009;364(1531):2957-67.
9. Frisen L. Identification of functional visual field loss by automated static perimetry. *Acta Ophthalmol*. 2014.
10. Kilian Schulze-Bonsel NF, Hermann Burau, Lutz Hansen and Michael Bach. Visual Acuities "Hand Motion" and "Counting Fingers" Can Be Quantified with the Freiburg Visual Acuity Test. 2006.
11. de Kinkelder R, van Leeuwen TG, Verbraak FD. Detection of early-stage age related macular degeneration with a compact rarebit test. *The British journal of ophthalmology*. 2012;96(10):1354-5.
12. Meng W, Butterworth J, Calvas P, Malecaze F. Myopia and iris colour: a possible connection? *Medical hypotheses*. 2012;78(6):778-80.
13. Nischler C, Michael R, Wintersteller C, Marvan P, van Rijn LJ, Coppens JE, et al. Iris color and visual functions. *Graefe's archive for clinical and experimental ophthalmology = Albrecht von Graefes Archiv fur klinische und experimentelle Ophthalmologie*. 2013;251(1):195-202.